CHAPTER 3

Impact and Influence of Two Premier Physics Journals: A Comparative Bibliometric Study

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INTRODUCTION

Bibliometric studies can be applied to any field of knowledge to find out trends and growth of the literature. In this case, the selection of source for collection of the data is crucial. Since journal articles include current research, usually journals are considered as a source for conducting bibliometric studies on individual journals for a definite period of time (Daim et al, 2005; Kulkarni, 2009). This study attempts to provide comparative trends of publications and citation behaviours of two leading Physics

journals namely, '*Advances in Physics'* and '*Annual Review of Astronomy and Astrophysics*' that carries immense significance to bibliometric scholars in general and the readers of these journals in particular.

Mention may be made that, "*Advances in Physics* publishes authoritative critical reviews by experts on topics of interest and importance to condensed matter physicists. It is intended for motivated readers with a basic knowledge of the journal's field and aims to draw out the salient points of a reviewed subject from the perspective of the author. The journal's scope includes condensed matter physics and statistical mechanics: broadly defined to include the overlap with quantum information, cold atoms, soft matter physics and biophysics. 2012 ISI Impact Factor of *Advances in Physics is* 34.294".[1] Similarly, "*Annual Review of Astronomy and Astrophysics*, in publication since 1963, covers the significant developments in the field of Astronomy and Astrophysics, including: the sun; solar system and extrasolar planets; stars; the interstellar medium; galaxy and galaxies; active galactic nuclei; cosmology; and instrumentation and techniques, and the history of the development of new areas of research. According to the *Journal Citation Reports*, the journal has a 2012 impact factor of 23.333".[2]

METHODOLOGY

The bibliographic data of the articles published in these two stated journals from 2008 to 2013 were retrieved from Scopus (Elsevier Bibliographic Database). The obtained data were transported into MS Excel file and major facets like authorship pattern, country wise distribution of contributions, etc were analyzed using appropriate bibliometric measures. Citations to individual papers were retrieved through *Scopus* in order to provide a clear picture of the impact of these stated journals.

OBJECTIVES

- To identify the number of contributions published in the studied journals during 2008 to 2013;
- To compare the year wise distribution of publications;
- To study the authorship pattern of research publications of the respective journals;
- To find out the degree of collaboration in of the respective journals;
- To ascertain the citation counts of individual papers as recorded in Scopus; and
- To find out the impact factor and immediacy index of these two journals with respect to records of Scopus citation.

LITERATURE REVIEW

Tsay (2011) studied three journals, namely, "*Journal of the American Society for Information Science and Technology* (JASIST)", "*Information Processing and Management* (IPM)" and "*Journal of Documentation* (JOD)" published from 1998 to 2008. The study revealed that the characteristics of the cited journals and books confirmed that all journals under study are information science oriented, except JOD which is slanted towards library science. JASIST and IPM are very much in common and diffuse to other disciplines more deeply than JOD. Swain (2011) studied "*Library Philosophy and Practice* (LPP) from 2004 to 2009" and revealed that major cited journals in LPP were from the core field of Library Science followed by Education, Medical Sciences, Sociology, Psychology, and Computer Science and the authorship productivity pattern of LPP partially complied with Lotka's Law at a slightly greater n value (n=2.54). Jena, Swain, and Sahu (2012) found that the majority of articles published in the journal *The Electronic Library* (TEL) fall under the category

of *research papers*, followed by *case studies*, and *general reviews* and the majority of citations are from *journals*, followed by *web resources* and *books*. The study further revealed that the average length of articles in TEL is over 13 pages per article.

Sethi and Panda (2012) studied two core library and information science journals indexed in Scopus Database during the period between 2000 and 2010 namely, the *International Information & Library Review* and the *Library & Information Science Research*. They identified the eight most productive authors in this field, who produced 19 publications each. Qiu and Zhou (2012) conducted a bibliometric analysis of 2152 papers, published in the *Journal of Shanghai Jiaotong University (Medical Science)* from 2006 to 2010 and found that twenty-four authors published no less than 15 papers, indicating that all of them were holding a senior title or were academic leaders. The study further revealed that one thousand and thirteen papers were cited for no less than 1 time, 13 papers were cited for no less than 10 times, and the average citation frequency was 0.98. Swain, et al.(2013) studied *Library Review* from 2007 to 2011 and found that the degree of collaboration in the publications of *Library Review* is 0.36 and the journal has accommodated over 22 citations per article. In regard to country productivity, the UK led the table, followed by USA and Nigeria. Satpathy, Maharana and Das (2014) studied top ten open access journals of library and information science of the year 2011 and found that the collaborative trend of research in *Journal of Digital Information* (*JODI*) is more in comparision to other open access journals considered for the study.

ANALYSIS OF YEAR WISE DISTRIBUTION OF ARTICLES

Table 1 shows that *Advances in Physics* has published a total of *51* articles from 20008 to 2013 averaging over 8 articles per year

where as *Annual Review of Astronomy and Astrophysics* has published a cumulative total of 86 articles averaging a little over 14 articles per year during the stated period.

Table 1: Year wise distribution of articles

Year	Advances in Physics	Annual Review of Astronomy and Astrophysics
2008	9	14
2009	9	14
2010	10	17
2011	9	14
2012	7	14
2013	7	13
Total	51	86

AUTHORSHIP PATTERNS

Authorship patterns of the two journals are presented in table 2 and table 3. It is found that contribution from single authors is found more in both the journals in comparison to multi authored contributions. However, the presence of two authored contributions is found more in the journal *Annual Review of Astronomy and Astrophysics* than the journal *Advances in Physics.*

Table 2: Authorship patterns: *Advances in Physics*

Authorship pattern	2008	2009	2010	2011	2012	2013	Total	%
Single	5	2	6	4	4	0	21	41.18
Two	1	4	0	2	0	2	9	17.65
Three	2	3	3	3	1	3	15	29.41
> Three	1	0	1	0	2	2	6	11.76
Total	9	9	10	9	7	7	51	100.00

Table 3: Authorship patterns: Annual Review of Astronomy and Astrophysics

Authorship pattern	2008	2009	2010	2011	2012	2013	Total	%
Single	6	4	8	5	7	2	32	37.21
Two	4	7	6	5	4	5	31	36.05
Three	4	2	2	4	3	5	20	23.26
> Three	0	1	1	0	0	1	3	3.49
Total	14	14	17	14	14	13	86	100.00

COMPARISON OF DEGREE OF COLLABORATION IN TWO JOURNALS

The degree of collaboration provides a clear picture about the depth of collaborative research. The degree of collaboration can be computed using Subramanyam's (1983) formula as:

$$DC=\frac{NM}{NM+NS}$$

Where: DC=Degree of collaboration; NM=number of multiple authored papers; and NS=Single authored papers.

DC in *Advances in Physics*=0.58

DC in *Annual Review of Astronomy and Astrophysics*=0.62

It is evident that the collaborative trend of research is more intense in the publications of *Annual Review of Astronomy and Astrophysics* than *Advances in Physics*.

Impact Measure of the Two Journals as Reported in the Year Wise SJR Values

"This platform takes its name from the SCImago Journal Rank (SJR) indicator, developed by SCImago from the widely known

algorithm Google PageRank™. This indicator shows the visibility of the journals contained in the Scopus® database from 1996. **These indicators can be used to assess and analyze scientific domains."[3] The obtained values of SJR for the journals starting from the year 1999 from Scopus are depicted in figure 1 & figure 2 respectively.**

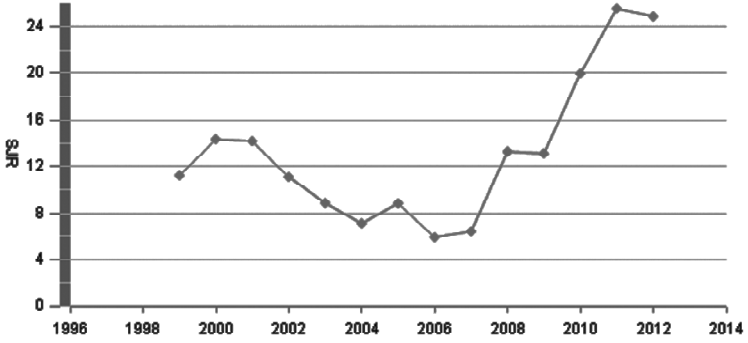

Figure 1: SJR Values of Advances in Physics since 1999

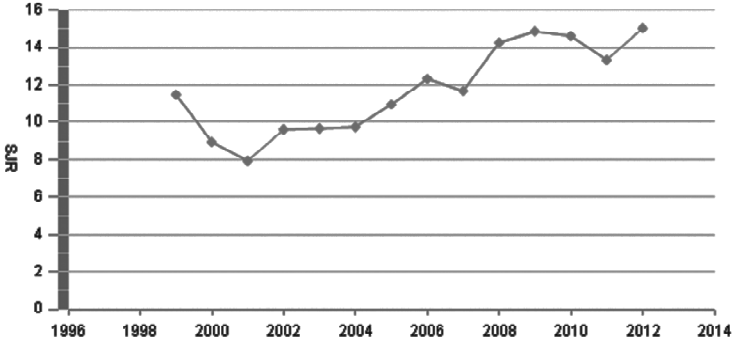

Figure 2: Annual Review of Astronomy and Astrophysics since 1999

It is found that the values of SJR for *Advances in Physics though* have witnessed an up and down trend right up to the year 2010 but it has recorded a steady rising trend afterwards indicating

its peak performance in the recent years. Concurrently, *Annual Review of Astronomy and Astrophysics presents* an impressive performance over years. However, the impact of the former journal appears to be higher than the latter during the last five years.

A comparative view of Country wise distribution of papers in the respective journals

Country wise distribution of papers published in *Advances in Physics* and *Annual Review of Astronomy and Astrophysics* are presented in Table 4 and Table 5. It is found that *Advances in*

Table 4: Country wise distribution of papers: *Advances in Physics*

Sl No.	Rank	Country	No. of papers	% of share
1	1	United States	17	26.15
2	2	Germany	13	20.00
3	3	France	7	10.77
4	4	United Kingdom	4	6.15
5	5	Australia	3	4.62
6	=5	Ireland	3	4.62
7	6	Hungary	2	3.08
8	=6	Israel	2	3.08
9	7	Austria	1	1.54
10	=7	Belgium	1	1.54
11	=7	Brazil	1	1.54
12	=7	Canada	1	1.54
13	=7	China	1	1.54
14	=7	Hong Kong	1	1.54
15	=7	India	1	1.54
16	=7	Italy	1	1.54
17	=7	Japan	1	1.54
18	=7	Netherlands	1	1.54
19	=7	New Zealand	1	1.54
20	=7	Poland	1	1.54
21	=7	Spain	1	1.54
22	=7	Sweden	1	1.54

Table 5: Country wise distribution of papers: *Annual Review of Astronomy and Astrophysics*

Sl No	Rank	Country	No. of papers	% of share
1	1	United States	54	44.26
2	2	Germany	19	15.57
3	3	United Kingdom	14	11.48
4	4	France	5	4.10
5	=4	Netherlands	5	4.10
6	5	Italy	4	3.28
7	=5	Japan	4	3.28
8	6	Australia	3	2.46
9	=6	Belgium	3	2.46
10	7	Canada	2	1.64
11	=7	Chile	2	1.64
12	=7	Switzerland	2	1.64
13	8	Austria	1	0.82
14	=8	Brazil	1	0.82
15	=8	South Korea	1	0.82
16	=8	Spain	1	0.82
17	=8	Sweden	1	0.82

Physics has accommodated papers from 22 countries, while Annual *Review of Astronomy and Astrophysics has witnessed representations from 17 countries.* It is further evident that the share of contributions from the United States and Germany are invariably found more in both the journals.

HIGHLY CITED PAPERS

The study reveals that the article entitled, "The puzzle of high temperature superconductivity in layered iron pnictides and chalcogenides' by Johnston, D.C is the most outstanding article published in the journal *Advances in Physics* in 2010 that has been cited by as many as 521 times. On the contrary, the article entitled, "The chemical composition of the sun" by Asplund, M published in *Annual Review of Astronomy and Astrophysics* in

Table 6: Papers of *Advances in Physics* cited more than 100 times

Sl No	Title	Author	Year	Cited by
1	The puzzle of high temperature superconductivity in layered iron pnictides and chalcogenides	Johnston, D.C.	2010	521
2	Multiferroicity: The coupling between magnetic and polarization orders	Wang, K.F., Liu, J.-M., Ren, Z.F.	2009	419
3	Properties of graphene: A theoretical perspective	Abergel, D.S.L., Apalkov, V., Berashevich, J., Ziegler, K., Chakraborty, T.	2010	303
4	Matrix product states, projected entangled pair states, and variational renormalization group methods for quantum spin systems	Verstraete, F., Murg, V., Cirac, J.I.	2008	185
5	Heat transport in low-dimensional systems	Dhar, A.	2008	168
6	Rapidly rotating atomic gases	Cooper, N.R.	2008	166
7	Lattice symmetry breaking in cuprate superconductors: Stripes, nematics, and superconductivity	Vojta, M.	2009	149
8	Memory effects in complex materials and nanoscale systems	Pershin, Y.V., Di Ventra, M.	2011	139
9	Coherent methods in the X-ray sciences	Nugent, K.A.	2010	122
10	Dynamics and statistical mechanics of ultra-cold Bose gases using c-field techniques	Blakie, P.B., Bradley, A.S., Davis, M.J., Ballagh, R.J., Gardiner, C.W.	2008	117
11	Dynamics of a quantum phase transition and relaxation to a steady state	Dziarmaga, J.	2010	114

Table 7: Papers of Annual Review of Astronomy and Astrophysics cited more than 100 times

Sl No	Title	Author	Year	Citations
1	The chemical composition of the sun	Asplund, M., Grevesse, N., Sauval, A.J., Scott, P.	2009	1132
2	Dark energy and the accelerating universe	Frieman, J.A., Turner, M.S., Huterer, D.	2008	405
3	Interstellar polycyclic aromatic hydrocarbon molecules	Tielens, A.G.G.M.	2008	308
4	Nuclear activity in nearby galaxies	Ho, L.C.	2008	269
5	Progenitors of core-collapse supernovae	Smartt, S.J.	2009	227
6	Star-Formation Histories, Abundances, and kinematics of dwarf galaxies in the local group	Tolstoy, E., Hill, V., Tosi, M.	2009	238
7	Evolution of debris disks	Wyatt, M.C.	2008	223
8	A universal stellar initial mass function? a critical look at variations	Bastian, N., Covey, K.R., Meyer, M.R.	2010	204
9	Complex organic interstellar molecules	Herbst, E., Van Dishoeck, E.F.	2009	185
10	The growth mechanisms of macroscopic bodies in proto-planetary disks	Blum, J., Wurm, G.	2008	183
11	Neutron-capture elements in the early galaxy	Sneden, C., Cowan, J.J., Gallino, R.	2008	178
12	Gamma - ray bursts in the swift era	Gehrels, N., Ramirez-Ruiz, R., Fox, D.B.	2009	154
13	Protoplanetary disks and their evolution	Williams, J.P., Cieza, L.A.	2011	136
14	Young massive star clusters	Portegies Zwart, S.F., McMillan, S.L.W., Gieles, M.	2010	134
15	Dark matter candidates from particle physics and methods of detection	Feng, J.L.	2010	124
16	Cosmological parameters from observations of galaxy clusters	Allen, S.W., Evrard, A.E., Mantz, A.B.	2011	122
17	Hot subdwarf stars	Heber, U.	2009	122
18	Magnetic fields of nondegenerate stars	Donati, J.-F., Landstreet, J.D.	2009	111
19	Supernova remnants at high energy	Reynolds, S.P.	2008	104

2009 is the masterpiece with a record number of 1132 citations. The articles of both the journals which have been cited more than 100 times are presented in Table 6 and Table 7.

Comparison of year wise distribution of Cumulative Citations

It is evident from the study that a total of 51 papers published in *Advances in Physics* from 2008 to 2013 have received in all 2463 citations averaging over 48 citations per paper. At the same time, a total of 86 papers published in *Annual Review of Astronomy and Astrophysics* during the stated period have been cited in all 6766 times averaging over 78 citations per paper indicating its better influence than *Advances in Physics*. The year wise breakup of the cumulative citations of the two journals is presented in Table 8 and Table 9.

Table 8: Cumulative Citations of *Advances in Physics* papers

Year of publication	No. of publications	Cited papers	Papers without citation	Total citations	Current citations (citations in 2013)	h-index
2008	9	8	1	798	187	8
2009	9	8	1	803	192	7
2010	10	8	2	1220	375	8
2011	9	5	4	318	137	5
2012	7	6	1	75	67	4
2013	7	3	4	47	35	3
Total	51	38	13	2463	806	-

Note: Citations data were retrieved on 12 February, 2014

Computation of Impact factor and Immediacy index based on Scopus citations

The journal impact factor published each year in the JCR (Thomson Reuters) may be considered as a barometer in assessing

Table 9. Cumulative Citations of *Annual Review of Astronomy and Astrophysics* papers

Year of publication	No. of publications	Cited papers	Papers without citation	Total citations	Current citations (citations in 2013)	h-index
2008	14	13	1	2019	409	13
2009	14	13	1	2529	725	13
2010	17	17	0	1121	381	16
2011	14	12	2	636	322	11
2012	14	13	1	390	323	10
2013	13	10	3	71	45	5
Total	86	78	8	6766	2205	-

Note: Citations data were retrieved on 12 February, 2014

the impact of a journal but it has been subjected to much controversies and a good deal of misunderstanding (Pendlebury, 2009) as it considers exclusively citations recorded in Web of Science. To support the already obtained 2012 ISI Impact factor of these two journals purely based on web of science citations data (2012 ISI Impact Factor of *Advances in Physics is* 34.294; 2012 impact factor of *Annual Review of Astronomy and Astrophysics* is 23.333), impact factor of these journals for 2013 based on Scopes citations can be explored through established formula for *Impact Factor* computation.

Sen (1999) demonstrates that, the computation of *impact factor* for a journal is done using the following formula:

$$I_{f(j)} = C_1 + C_2 / S_1 + S_2$$

Where, $I_{f(j)}$ is *impact factor* for journal j for the year Y. $\mathbf{S_1}$ is the source items published in the year Y-1. $\mathbf{S_2}$ is the source items received for the year Y. $\mathbf{C_1}$ is the number of citations S_1 source items received for the year Y C_2 is the number of citations received by S_2 source items in the year Y.

By putting the values of C_1, C_2, S_1, S_2 in the above equation, we get the *2013 impact factor* of ***Advances in Physics*** =67+137/7+9=12.75

2013 impact factor of ***Annual Review of Astronomy and Astrophysics*** =323+322/14+14=23.035

Similarly, the immediacy index of *the above journals* can be explored through the formula demonstrated by Sen(199) as:

$$\mathbf{I_X\ (\textit{Advances in Physics}) = C/S}$$

Where, I_X (***Advances in Physics***) is the immediacy index of the journal ***Advances in Physics*** in the calendar year 2013. 'C' is the number of citations received in the current year (2013) by the source items of 2013. By putting the values of 'C' and 'S' in the above equation, the immediacy index of ***Advances in Physics*** is found to be 5.00 (35/7).

Immediacy index of ***Annual Review of Astronomy and Astrophysics*** is 3.46 (45/13).

CONCLUSION

It is observed from the study that both the journals *Advances in Physics and Annual Review of Astronomy and Astrophysics* are indeed the two outstanding journals in the field of Physics. The quantum of citations received by both the journals indicates that they received considerable impact and influence to the field they represent. The immediacy indexes of both the journals reveal that the papers published in the journals have immediate impact. Most interestingly, the article entitled, "the puzzle of high temperature superconductivity in layered iron pnictides and chalcogenides' by Johnston, D.C is found to be the most outstanding article published in the journal *Advances in Physics* in 2010 that has been cited by as many as 521 times. On the contrary, the article entitled, "The chemical composition of the sun" by Asplund, M

published in *Annual Review of Astronomy and Astrophysics* in 2009 is the masterpiece with a record number of 1132 citations. It is deduced that the mentioned journals have followed a nice editorial policy and meticulous review system at their respective levels to ensure that the published articles are reasonably cited. Hence, why authors prefer to get published in these two outstanding journals is quite understandable.

Notes

1. http://www.tandfonline.com/action/journalInformation?show=aimsScope&journalCode=tadp20#.UvxAlvuxdLU
2. http://www.annualreviews.org/journal/astro
3. http://www.scimagojr.com/

REFERENCES

1. Daim, T. U., Rudeda, G., Martin, H, and Gerdsri P.(2006), "Forecasting emerging technologies: Use of bibliometrics and patent analysis", *Technological Forecasting and Social Change*, Vol.73 No.8, pp.981-1012.
2. Jena, K. L., Swain, D. K.. and Sahu, S. B.(2012). Scholarly communication of The Electronic Library from 2003-2009: a bibliometric study", *The Electronic Library*, Vol.30 No.1, pp.103 – 119.
3. Kulkarni A. P., Poshett, B.; and Narwade G R, (2009), "Indian Journal of Pharmaceutical Education and Research (1996-2006) – A bibliometric analysis", *Annals of Library and Information Studies*, Vol.56 No.4, pp. 242-248.
4. Pendlebury, D. A. (2009), "The use and misuse of journal metrics and other citation indicators", *Archivum Immunologiae et Therapiae Experimentalis*, Vol.57 No.1, pp.1-11.
5. Qiu, X. C. and Zhou, Z. F. (2012), "Bibliometric analysis of Journal of Shanghai Jiaotong University (Medical Science) during 2006 to 2010", *Journal of Shanghai Jiaotong University (Medical Science)*, Vol.32 No.1, pp.101-106.
6. Satpathy, S.K., Maharana, R. K., and Das, A. K. (2014), "Open source journals of library and information science: a bibliometric study", *Collection Building*, Vol.33 No.1, Early Cite Paper.
7. Sen, B. K. (1999), "Symbols and formulas for a few bibliometric concepts", *Journal of Documentation*, Vol.55 No.3, pp.325 – 334.

8. Sethi, B. B. and Panda, K. C. (2012), "Growth and nature of international LIS research: an analysis of two journals", *International Information and Library Review*, Vol. 44 No.2, pp.86-99.
9. Swain, C. K., Swain, D. K. and Rautaray, B. (2013), "Bibliometric analysis of Library Review from 2007 to 2011", *Library Review*, Vol.62 No. 8/9, pp. 602-618.
10. Swain, D. K. (2011), "Library Philosophy and Practice, 2004-2009: a scientometric appraisal", *Library Philosophy and Practice*, Annual volume 2011, available at: http://www.webpages.uidaho.edu/~mbolin/dillipswain-LPP.pdf (accessed 12 February, 2014).
11. Tsay, M. and Shu, Z. (2011), "Journal bibliometric analysis: a case study on the Journal of Documentation", *Journal of Documentation*, Vol.67 No.5, pp.806-822.